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April 26, 2021

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SUBJECT: **ISSAQUAH SCHOOL DISTRICT HIGH SCHOOL #4/ ELEMENTARY SCHOOL #17 TRAFFIC ANALYSIS SUPPLEMENT**

INTRODUCTION

This memorandum describes the recommended signalized saturated flow rate and SE 40th Street cut-through demand forecast for the Issaquah School District High School #4/Elementary School #17 Traffic Analysis.

SATURATION FLOW RATE

Signalized intersection saturation flow rate, an input in the HCM signalized Level of Service (LOS) methodology, is defined as the flow rate which would occur at a signalized intersection approach given saturated conditions and no interruption due to signal phasing. The WSDOT "Synchro & SimTraffic Protocol" provides the following recommendations for saturation flow rate.

> *The preferred methodology for determining the appropriate value is to conduct a field study. However, when that is not available, or feasible, the recommended values are 1750 urban areas, 1900 for rural.*

The submitted traffic analysis used a saturation flow rate of 1,900 vehicles per hour per lane (vphpl) for signalized intersections. This is the Synchro software default and is consistent with WSDOT guidance for rural areas, per the WSDOT "Synchro & SimTraffic Protocol – August 2018." Traffic Count Consultants, Inc. (TC2) collected saturation flow data at six locations during the week of February 18, 2020. Saturation flow data, provided in **Attachment 1**, was collected on school days.

Saturation flow data was analyzed using data collection methods described in the Institute of Transportation Engineers *Manual of Transportation Engineering Studies*. Results are summarized in **Table 1**.

Table 1. Sammamish Signalized Saturation Flow Rate

Intersection	Dir	Lane	Period	Sample Size (cycles)	Sat. Flow Rate (veh/hr/ln)
Sahalee Way & NE 37th Way	NB	Through	7-9 AM	-	*[1]
228th Ave NE & NE 8th St	NB	Inside-Through	7-9 AM	26	1,590
228th Ave NE & NE 8th St	EB	Through	4-6 PM	33	1,710
228th Ave SE & IPL Rd SE	SB	Through	7-9 AM	44	1,700
			4-6 PM	19	1,835
228th Ave SE & IPL Rd SE	SB	Left-Turn (2lns)	4-6 PM	18	1,680
AM Average				**70**	**1,660**
PM Average		*Through Lanes Only*		*52*	*1,755*
		w/ Left-Turn lanes		*70*	*1,735*
Overall Average				**140**	**1,700**

[1]Unable to collect saturation flow data due to rolling NB queue interrupting NB through lane

Saturation flow data collection was not possible at the intersection of Sahalee Way and NE 37th Way due to queue stacking from Sahalee Way at SR 202 impacting the intersection. The overall average saturation flow rate of 1,700 vphpl is slightly lower than WSDOT policy of 1,750 vphpl for urban intersections and significantly lower than the software default ideal saturation flow rate of 1,900 vphpl for signalized intersections in Sammamish.

Based on the analysis summarized above, in 2020 the City of Sammamish adopted a saturation flow rate of 1,750 vphpl at all signalized intersections in the City of Sammamish for the purposes of concurrency management.

SE 40TH STREET CUT-THROUGH DEMAND

The Project is considering a new traffic signal at the intersection of 228th Avenue SE & SE 40th Street. Adding a signal at this intersection will reduce peak period delay on SE 40th Street, reducing the penalty for local cut-through demand to bypass congestion along 228th Ave SE and Issaquah-Pine Lake Road to the north and east.

The Sammamish pipeline travel demand model was used to forecast non-Project neighborhood cut-through demand between 228th Ave SE and Issaquah-Pine Lake Road via SE 40th Street. The pipeline travel demand model incorporates all existing and permitted land use in the City of Sammamish, in addition to Puget Sound Regional Council (PSRC) regional growth forecasts external to the City. It represents the most accurate tool available for forecasting future travel demand within the City of Sammamish.

The impacts of signalization were modeled by reducing impedance along SE 40th Street relative to the anticipated delay reduction to westbound left-turn movements at 228th Ave & SE 40th St due to signalization. The citywide travel demand model does not produce HCM-level turn delay forecasts, so travel time savings were approximated.

Based on the pipeline travel demand forecast, signalization of 228th Ave SE & SE 40th St is anticipated to result in a net increase of approximately 67 non-Project westbound left-turn trips in the AM peak hour and 37 non-Project northbound right-turn trips in the PM peak hour at the intersection.

Attachment 1. Saturation Flow Data

Saturation Flow Study

Location: 228th Ave NE & NE 8th St

Approach: NB **Lane:** Inside through

Date: 2/20/2020 **Time:** 7-9 AM **City:** Sammamish, WA

Observer: TC2 **Weather:**

Grade: **Lane Width:** **Area:** Suburban **Other:** Site 02 (AM)

Cycle No.	Time (sec) between 4th vehicle and…				Veh 1 Lost Time
	7th veh.	8th veh.	9th veh.	10th veh.	
4				16.4	3.1
6	5.6				1.2
7				13.7	3.1
8				16.3	3.7
9				14.0	2.1
10				12.0	3.0
11				12.4	1.8
13				12.5	1.3
14	6.8				2.3
15				14.4	2.3
16		7.2			3.6
17	6.8				2.0
18				15.0	1.6
23	7.5				3.3
27			10.5		2.6
28	5.8				2.9
30	8.2				3.3
40	5.2				5.5
44		8.5			3.3
48				14.2	3.2
50	6.6				2.7
52				12.1	2.0
55			8.7		2.9
57			13.4		1.8
58				15.4	1.9
61		11.6			2.5
Sum	52.5	27.3	32.6	168.4	69.0

Mean Saturation Flow (vph) = 1590

Mean Startup Lost Time (sec) =

Saturation Flow Study

Location: 228th Ave NE & NE 8th St

Approach: EB **Lane:** Through

Date: 2/20/2020 **Time:** 4-6 PM **City:** Sammamish, WA

Observer: TC2 **Weather:**

Grade: **Lane Width:** **Area:** Suburban **Other:** Site 02 (PM)

Cycle No.	Time (sec) between 4th vehicle and…				Veh 1 Lost Time
	7th veh.	8th veh.	9th veh.	10th veh.	
3			8.3		3.8
4	5.4				1.9
5		9.9			2.0
7			9.0		4.2
10	8.2				2.6
15		10.5			1.1
16		8.9			2.2
17			12.4		2.2
21	6.3				1.6
25	5.1				2.2
26		7.0			1.7
27		9.3			1.5
29	6.3				3.3
30			11.0		3.4
34			9.9		4.7
36	6.3				1.3
37			8.9		2.0
38			10.3		2.7
40	7.8				1.4
41	5.7				2.7
44		8.8			2.4
45	6.8				2.7
46		7.8			4.9
47	8.2				3.0
48	7.9				2.8
49	5.6				2.2
51				14.2	2.0
52		7.3			
53			9.2		1.2
54				10.5	2.8
55				11.2	1.0
57				11.8	2.2
58				10.9	0.7
Sum	79.6	69.5	79.0	58.6	76.4

Mean Saturation Flow (vph) = 1710

Mean Startup Lost Time (sec) =

Saturation Flow Study

Location: 228th Ave SE & Issaquah-Pine Lake Rd SE

Approach: SB **Lane:** Through

Date: 2/20/2020 **Time:** 7-9 AM **City:** Sammamish, WA

Observer: TC2 **Weather:**

Grade: **Lane Width:** **Area:** Suburban **Other:** Site 03 (AM)

Cycle No.	Time (sec) between 4th vehicle and...				Veh 1 Lost Time
	7th veh.	8th veh.	9th veh.	10th veh.	
3				11.4	1.9
4				14.1	2.5
5				13.8	4.4
6				10.8	2.0
7	7.5				2.6
8				13.0	3.1
9				11.5	3.0
10				11.5	3.8
11				12.0	1.4
12				12.6	2.8
17				11.3	2.6
18				13.5	4.2
19				11.5	3.6
20				12.8	3.5
22				10.9	2.6
23		9.7			3.9
24				12.5	3.9
26				10.7	2.6
29				11.0	3.1
30				13.0	3.0
31		6.5			1.9
32				15.1	2.1
33			11.0		1.2
34		11.5			1.8
36				12.7	2.9
37				11.9	2.5
38				12.6	1.8
40		9.5			1.8
41				10.7	2.5
42				17.0	3.1
43		10.0			2.3
44				11.5	3.8
46				14.2	0.9
47				12.1	3.6
48		7.5			7.0
49				11.7	2.6
50				16.4	3.6
51				18.3	4.0
52				7.3	4.5
53				12.0	1.1
54				10.7	2.9
56				11.7	2.6
57				13.3	3.0
58				10.9	4.8
Sum	7.5	54.7	11.0	448.0	128.8

Mean Saturation Flow (vph) = 1700

Mean Startup Lost Time (sec) =

Saturation Flow Study

Location: 228th Ave SE & Issaquah-Pine Lake Rd SE

Approach: SB **Lane:** Through

Date: 2/20/2020 **Time:** 4-6 PM **City:** Sammamish, WA

Observer: TC2 **Weather:**

Grade: **Lane Width:** **Area:** Suburban **Other:** Site 03 (PM)

Cycle No.	Time (sec) between 4th vehicle and…				Veh 1 Lost Time
	7th veh.	8th veh.	9th veh.	10th veh.	
4				14.1	2.8
11			9.9		4.1
14			10.8		5.7
15				13.6	4.6
16				14.6	3.0
19				14.7	2.0
20				11.7	1.8
21				10.6	2.3
22				7.2	1.7
24			11.9		3.1
30	5.6				3.2
31	5.0				3.8
38		8.0			3.6
39				12.6	2.3
40				10.4	2.6
46			10.6		7.1
48			7.9		1.1
50			6.3		3.0
51		8.2			5.2
Sum	10.6	16.2	57.4	109.5	63.0

Mean Saturation Flow (vph) = 1835

Mean Startup Lost Time (sec) =

Saturation Flow Study

Location: 228th Ave SE & Issaquah-Pine Lake Rd SE

Approach: SB **Lane:** Inside Left

Date: 2/20/2020 **Time:** 4-6 PM **City:** Sammamish, WA

Observer: TC2 **Weather:**

Grade: **Lane Width:** **Area:** Suburban **Other:** Site 03 (PM)

Cycle No.	Time (sec) between 4th vehicle and…				Veh 1 Lost Time
	7th veh.	8th veh.	9th veh.	10th veh.	
4		7.7			3.2
9			13.2		4.6
10	5.5				
13	6.0				6.1
18		8.1			3.9
27			9.8		1.9
33	8.5				1.4
34	5.7				2.4
42		7.0			1.6
43		8.5			3.6
47			8.0		2.8
51				12.1	1.7
57				11.1	4.4
9			11.6		4.6
10	8.1				4.3
27		7.8			1.9
43	7.5				3.2
57	7.8				5.1
Sum	49.1	39.1	42.6	23.2	56.7

Mean Saturation Flow (vph) = 1680

Mean Startup Lost Time (sec) =